

Mathematics Grade 6

Mathematics is used as a means to communicate about quantities, logical relationships, and unknowns. Such a simplistic statement may make students who are not planning to go to college ask why mathematics is necessary for them. While the ability to do computation is important, it is the skills of problem finding and problem solving along with developing abstract thinking, symbolic representation and interpretation, logical arguments, and objective reasoning that allow us to function effectively and understand our world.

Mathematics is the one area of coursework in the school curriculum where students are taught these skills, and where answers cannot be obtained just by common sense and guessing. Even without an ever-increasing reliance on technology, mathematical skills meet needs for practical everyday life, intelligent citizenship, and future employment. A study by Arizona State University indicated that students who opt out of advanced levels of mathematics and science may now eliminate up to 75% of career opportunities from which to choose[†]. Algebra has been called the academic passport for passage into virtually every facet of the job market. Employers want their employees to be able to set up problems, estimate solutions, identify how accurate solutions need to be, work with other people to reach goals, know the many different types of mathematics that exist, and determine which one is needed in a particular situation. It is clear that the mathematical literacy of the twentieth century will **not** be sufficient for the twenty-first century.

[†]ASU Research Fall 1998, p. 41

About the Test

The AIMS DPA Mathematics test contains approximately 80 multiple-choice questions. Fifty-five of the items are AIMS questions. Fifteen items are *TerraNova* and AIMS questions, and 10 items are *TerraNova* questions. Calculators are not allowed; however, the calculations required can be readily handled with pencil and paper. The questions will emphasize conceptual understanding, process, and problem-solving skills rather than just computation skills.

Hints for Taking AIMS DPA Mathematics

- Remember, this is not a timed test. Take your time and do your best work.
- Check to see if your answer is reasonable.
- Since calculators are not allowed on this test, double-check your work!

Sample Questions for

Mathematics

What To Expect From This Section

This AIMS DPA Student Guide for Mathematics provides examples of the format and types of questions that will appear on AIMS Mathematics. An attempt has been made to provide a sampling of the types of questions that might be asked, however, not every concept in each strand has a corresponding sample question in this guide. An answer key for all Mathematics sample questions is provided in the appendices. Additionally, you will find an AIMS DPA Mathematics Reference Sheet in the appendices. The reference sheet in the actual AIMS DPA Mathematics test will be revised to reflect on the formulas and other information that will be included on the test.

Strand 1: Number Sense and Operations

General concepts you should know:

- Real number system and its various subsystems (natural, whole, integers, and rational).
- Operations with integers.
- Scientific notation.
- Estimation strategies.

1 Which of the following is the least common multiple (LCM) of 6 and 10?

- A** 2
- B** 10
- C** 30
- D** 60

2 What is the simplified form of the expression below?

$$84 \div (3 + 1)$$

- A** 21
- B** 28
- C** 29
- D** 42

3 Sixth graders at Rattlesnake School held a “Penny War” coin collection drive to raise money for some new equipment. The numbers of jars of coins collected by each class are shown below.

- ★ Ms. Alley’s class: $4\frac{2}{3}$
- ★ Mr. Horne’s class: $7\frac{2}{3}$
- ★ Ms. Lewis’ class: $6\frac{1}{2}$

What is the total number of jars of coins collected?

- A** $17\frac{5}{3}$
- B** $17\frac{5}{6}$
- C** $18\frac{5}{3}$
- D** $18\frac{5}{6}$

4 Tom's backpack contained the following items:

- ✓ one 8-pound sleeping bag,
- ✓ nine 1.5-pound meals, and
- ✓ four 2-pound water bottles.

Which of the following is closest to the total weight of the items in Tom's backpack?

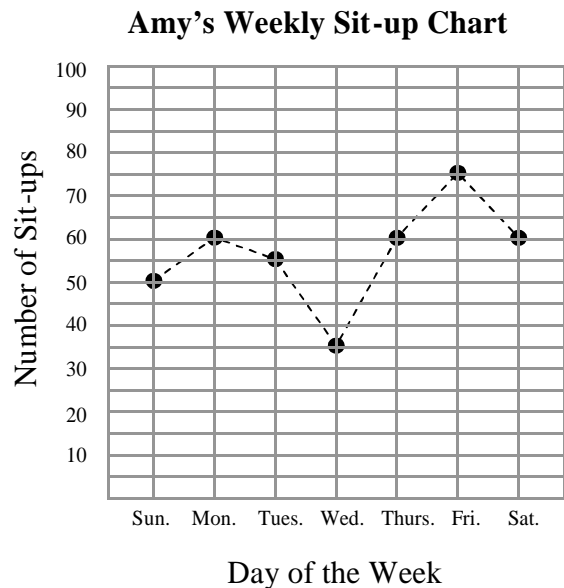
- A 12 pounds
- B 18 pounds
- C 23 pounds
- D 26 pounds

Strand 2: Data Analysis, Probability, and Discrete Math

General concepts you should know:

- Graphs (histograms, line graphs, circle graphs, frequency charts, stem-and-leaf plots, and scatter plots).
- Measures of central tendency, variability and correlation (mean, median, mode, and range).
- Pattern prediction.
- Probability.
- Probable outcomes of events.
- Systematic listing and counting; outcomes sets.
- Use of combinations vs. permutations.

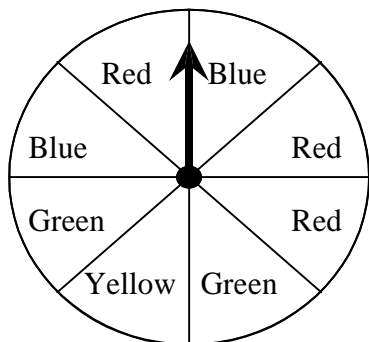
5 The graph below shows the number of sit-ups Amy did each day for a week.



Which of the following days did Amy do the fewest sit-ups?

- A Monday
- B Wednesday
- C Thursday
- D Sunday

- 6 Jennifer predicted that the spinner below would stop most often on red, since there were more red spaces on the spinner than any other color. Then she recorded the results of 20 spins.



Which results match Jennifer's prediction?

- A Red – 9 Blue – 4 Green – 5 Yellow – 2
 B Red – 7 Blue – 3 Green – 7 Yellow – 3
 C Red – 6 Blue – 4 Green – 7 Yellow – 3
 D Red – 5 Blue – 7 Green – 3 Yellow – 5
- 7 Mary rolled a cube with sides numbered from 1 to 6 and recorded her results in the chart below.

1 st roll	2 nd roll	3 rd roll	4 th roll	5 th roll	6 th roll
1	2	3	4	5	

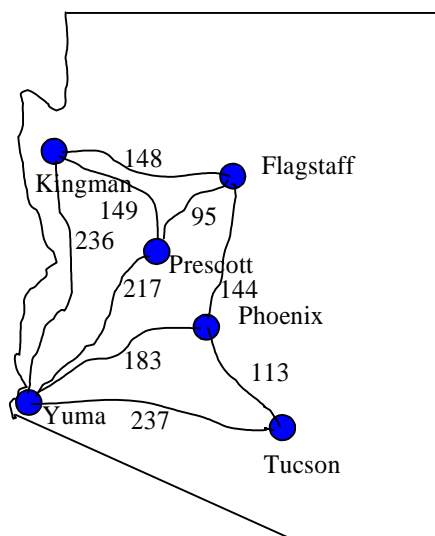
What is the probable result of the 6th roll?

- A definitely will be a 6
 B most likely to be a 6
 C least likely to be a 6
 D equally likely to be any number 1 to 6

- 8 Javier, Lisa, Michael, and Lamar sit in a row in Mrs. Yoder's class. How many different ways can she arrange them in the row?

- A 24
 B 12
 C 10
 D 4

- 9 The distance in miles between certain cities in Arizona is shown below.



What is the shortest path shown from Tucson to Kingman?

- A Tucson to Yuma to Kingman
 B Tucson to Phoenix to Flagstaff to Kingman
 C Tucson to Phoenix to Yuma to Kingman
 D Tucson to Phoenix to Flagstaff to Prescott to Kingman

Strand 3: Patterns, Algebra, and Functions

General concepts you should know:

- Identify and extend patterns.
- Graphing, evaluating, simplifying, and solving simple linear equations.
- The slope of a line and what it represents.

- 10** Megan used an input/output model that produced the following numbers.

Input		Output
48		4
72		6
108		9

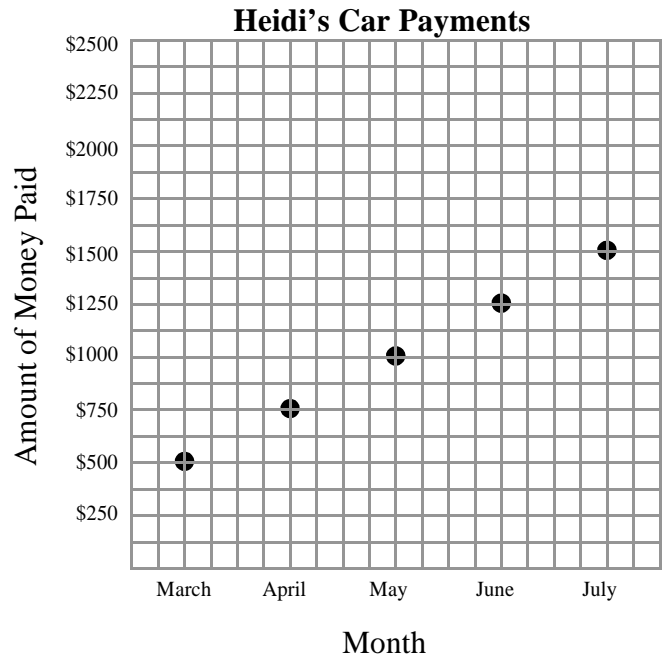
What is the rule for the input/output model?

- A** add 44
- B** subtract 44
- C** divide by 12
- D** multiply by 12
- 11** What is the value of x in the equation below?

$$14x = 126$$

- A** 9
- B** 8
- C** 7
- D** 6

- 12** The graph below represents the amount of money Heidi has paid toward the purchase of a car.



How much money had Heidi paid on her car after she made her June payment?

- A** \$750
- B** \$1000
- C** \$1250
- D** \$1500

13 Jamal makes 3 rings each hour he works. What is the **best** estimate of how many hours it will take him to make a total of 80- rings?

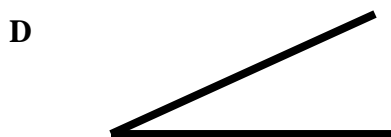
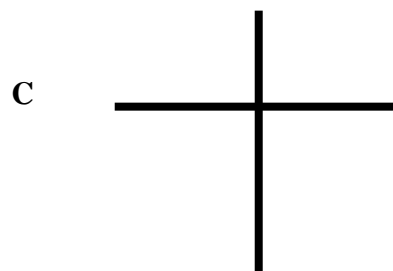
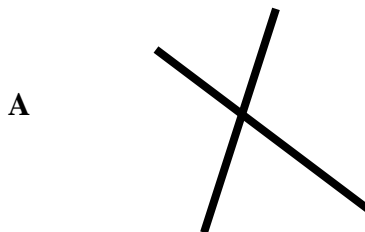
- A** 32 hours
- B** 25 hours
- C** 21 hours
- D** 20 hours

Strand 4: Geometry and Measurement

General concepts you should know:

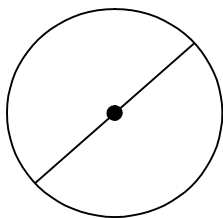
- Geometric relationships (parallelism, perpendicularity, congruency).
- Angle characteristics (complementary, supplementary, and congruent).
- Circle characteristics (arcs, chords and inscribed angles).
- Identification of prisms, pyramids, cones, cylinders, and spheres.
- Transformations (reflections, rotations, dilations, translations; symmetry).
- Appropriate units of measure, applications of techniques and formulas.
- Perimeter, area, volume; measuring line segments, lines, angles, 2-D and 3-D figures.

14 Which of the following figures appears to represent parallel lines?

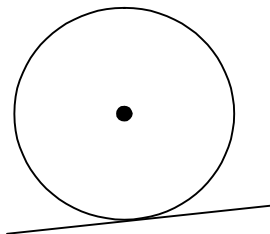


- 15** Which of the following represents a radius of a circle?

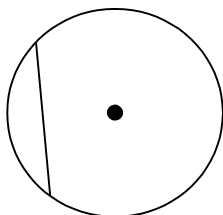
A



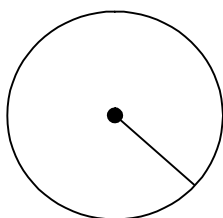
B



C



D



- 16** A performance troupe presents 8 one-act plays each Saturday. Each play lasts 25 minutes and there is a 10-minute break between plays.

How many total hours does it take for the troupe to present the plays each Saturday?

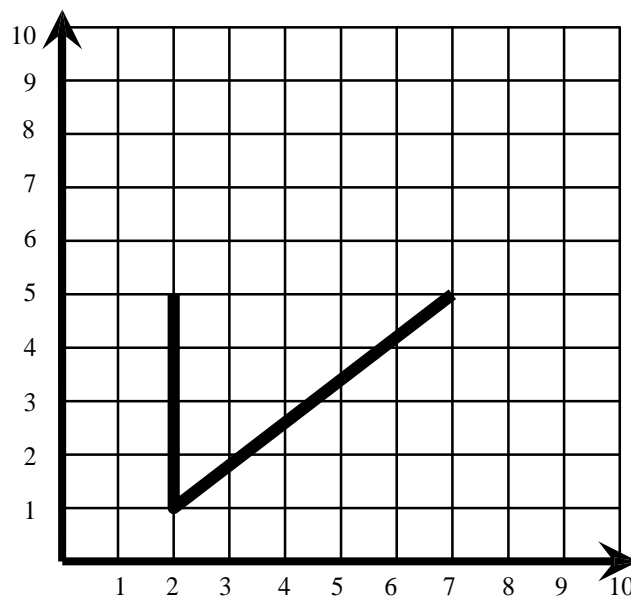
A $4\frac{1}{2}$ hours

B 4 hours

C $3\frac{1}{3}$ hours

D 3 hours

- 12** Stephanie began drawing a parallelogram, shown below.



What are the coordinates (ordered pair) of the missing vertex?

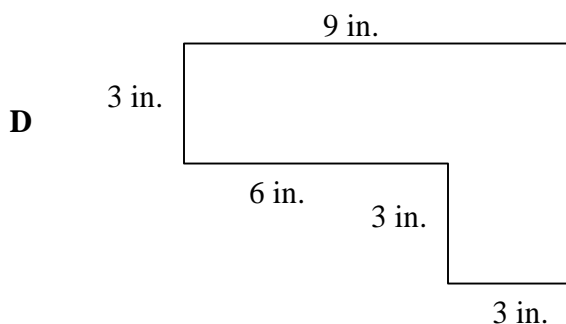
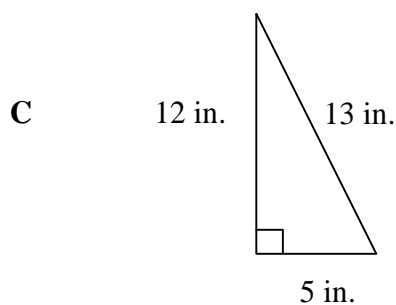
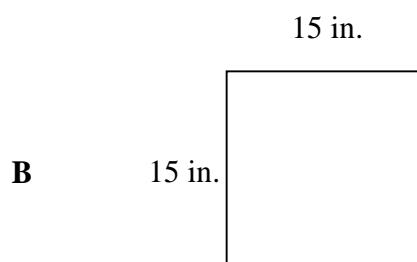
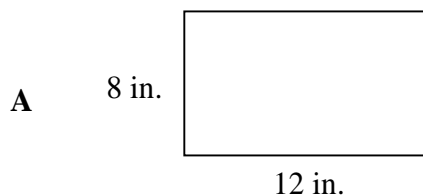
A (7, 8)

B (8, 7)

C (7, 9)

D (9, 8)

18 Which of the following polygons has an area of 30 square inches?



Strand 5: Structure and Logic

General concepts you should know:

- Inductive and deductive reasoning.
- Validity of arguments.

19 The following are the results for the highest scores on Mrs. Pundt's reading test.

- Marion scored higher than Mark, but lower than Marilyn.
- Ruben's score was one point higher than Marilyn.

Which of the following is the correct order for the students' scores, from highest to lowest?

- A** Ruben, Marilyn, Mark, Marion
- B** Mark, Marion, Marilyn, Ruben
- C** Mark, Marion, Ruben, Marilyn
- D** Ruben, Marilyn, Marion, Mark

AIMS Reference Sheet

Reminders	yz means $y \times z$	Use 3.14 or $\frac{22}{7}$ for π .
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Plane Figures: Perimeters and Areas

Name	Notation	Circumference (C) Perimeter (P)	Area (A)
Circle	r = radius d = diameter	$C = \pi d$ or $C = 2\pi r$	$A = \pi r^2$
Parallelogram	a, b = sides h = height	$P = 2(a + b)$	$A = bh$
Rectangle	b = base h = height	$P = 2(h + b)$	$A = bh$
Trapezoid	a, b, c, d = sides b_1 = long base b_2 = short base h = height	$P = a + b + c + d$	$A = \frac{(b_1 + b_2)h}{2}$
Triangle	a, b, c = sides h = height	$P = a + b + c$	$A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$

Geometric Solids: Volumes and Surface Areas

Name	Notation	Volume (V)	Surface Area (SA)
Rectangular Prism	l = length w = width h = height	$V = lwh$	$SA = 2lw + 2lh + 2wh$
Rectangular Pyramid	B = area of the base h = height	$V = \frac{1}{3}Bh$ or $V = \frac{Bh}{3}$	
Right Cylinder	r = radius h = height	$V = \pi r^2 h$	$SA = 2(\pi r^2) + 2\pi rh$
Right Cone	r = radius h = height	$V = \frac{1}{3}\pi r^2 h$ or $V = \frac{\pi r^2 h}{3}$	
Sphere	r = radius	$V = \frac{4}{3}\pi r^3$	

Scoring Key

Mathematics Key

Question #1: C
Question #2: A
Question #3: D
Question #4: D
Question #5: B
Question #6: A
Question #7: D
Question #8: A
Question #9: B
Question #10: C
Question #11: A
Question #12: C
Question #13: B
Question #14: B
Question #15: D
Question #16: A
Question #17: C
Question #18: C
Question #19: D